MACROECONOMICS II

The Demand for Money
The Demand for Money

A look back at the basics:

• Money is used by economists in a technical sense:
  – Medium of exchange (means of payment)

• Thus, in talking of the demand for money, the emphasis is on the stock of assets held as cash, demand deposits/checking accounts and closely related assets.
The Demand for Money

A look back at the basics:

• Which assets constitute money?

• More informally, it is whatever is generally accepted in exchange. And this has historically range from a diverse group of items, such as seashells, metals, pieces of paper, and now currency in various forms.
The Demand for Money

A look back at the basics:

- The Components of the Money Stock:
  - In many modern economies, this ranges from currency to other complicated claims on other financial assets.
The Demand for Money

A look back at the basics:

• The Components of the Money Stock:
  – **M1**: claims that can be used directly, instantly, and without restrictions to make payments.
  – M1 is liquid; can be used immediately, conveniently and cheaply used for making payments.
The Demand for Money

A look back at the basics:

• The Components of the Money Stock:
  – M1 = Currency + Demand Deposits + Travellers’ Cheques + Other Checkable Deposits
  – M2: includes, in addition to M1, claims that are not instantly liquid.
  – M2 = M1 + Savings deposits + Time deposits
The Demand for Money

A look back at the basics:
• The Functions of Money: it is impossible for a modern economy to function effectively without the use of money.
• Contrast that with the experience of a barter system, where every transaction has to involve an exchange of goods and/or services on both sides of the transaction.
The Demand for Money

A look back at the basics:

• The Functions of Money:
  – Medium of Exchange (overcomes problem of double coincidence of wants)
  – Store of Value (maintains value over time)
  – Unit of Account (price quotations & accounting)
  – Standard of Deferred Payment (loans)
The Demand for Money

• Previously, we have seen how money – both the demand of, and the supply of – is crucial in the analysis of many issues in macroeconomics.

• One important aspect is the effectiveness of monetary policy in the IS – LM framework, which describes the economy in the short-run when prices are sticky.
The Demand for Money

• We have previously learnt that the demand for real balances could be divided into a *speculative demand component*, inversely related to the interest rate, and a *transactions demand component*, positively related to income and inversely related to the interest rate.
The Demand for Money

• It is important to emphasise that the demand for money is a demand for real balances \((M/P)\).

• In other words, individuals hold money for its purchasing power – for the amount of goods and services money can command – and not concerned with nominal money holdings.
The Demand for Money

• Two implications follow:
  – *Real money demand* is unchanged when the price level increases, and all real variables (interest rate, real income, real wealth) remain unchanged.
  – *Nominal money demand* increases in proportion to the increase in the price level, given the real variables.
The Demand for Money

- The two implications mean that an individual is free from money illusion if a change in the level of prices, holding real variables constant, leaves the individual’s real behaviour, including real money demand unchanged.
The Demand for Money

• Initially, our introduction to the demand for money started with the quantity theory of money, which assumes that the demand for real balances is proportional to income. This gives the expression:

\[ \left( \frac{M}{P} \right)^d = kY \]
The Demand for Money

• Where $k$ is a constant measuring how much money people want to hold for every cedi of income.

• A more realistic version of the money demand function was introduced in which the demand for real balances is dependent on income and interest rates.
The Demand for Money

• This gave this expression for the demand for money function:

\[
\left( \frac{M}{P} \right)^d = m(r, y)
\]

• with the demand for real balances increasing as \( y \) rises and decreasing as \( r \) rises.
The Demand for Money

• The demand for money theory aims to provide an answer/explanation to the basic question:

• If bonds earn interest and money does not, why should anyone hold money?
The Demand for Money

Synopsis of Theory of Money Demand

• More broadly, there are four prominent approaches to the demand for money!
  - The *Regressive Expectations model* attributed to Keynes and described by Tobin.
The Demand for Money

Synopsis of Theory of Money Demand

– Here people hold money when they expect bond prices to fall, that is, interest rates to rise, and thus expect that they would take a loss if they were to hold bonds. Because of variations in the expectations of interest rate movements across the population, at any given interest rate there will be someone expecting it to rise, and thus someone holding money.
The Demand for Money

Synopsis of Theory of Money Demand

–Tobin’s *liquidity preference approach* deals with the problem in the Keynesian approach by showing that if the return on bonds is uncertain, that is, bonds risky.
The Demand for Money

Synopsis of Theory of Money Demand

—Given that bonds are risky, then the investor worrying about both risk and return is likely to do best by holding both bonds and money.

—in other words, his/her optimum portfolio of assets should include some risky assets and some risk-free assets.
The Demand for Money

Synopsis of Theory of Money Demand

— Baumol and Tobin’s inventory approach to transactions demand shows that there is a transactions need for money to smooth out the difference between income and expenditure streams. But the higher the interest rate, the smaller these transactions demand balances.
The Demand for Money

Synopsis of Theory of Money Demand

– Friedman’s *modern version of the quantity theory of money*, analyses the demand for money as an ordinary commodity.
The Demand for Money

Synopsis of Theory of Money Demand

—Money can be viewed as a producer’s good; businesses hold cash balances to improve efficiency in their financial transactions and are willing to pay, in terms of forgone interest income, for this efficiency.
The Demand for Money

Synopsis of Theory of Money Demand

—From the consumer’s perspective, money yields utility in terms of smoothing out timing differences between expenditure and income streams, and also in terms of reducing risk.
The Demand for Money

Theories of Money Demand

— The theories to be reviewed correspond to Keynes’ famous three motives for holding money:

1. Transactions motive (regular payments)
2. Precautionary motive (unforeseen contingencies)
3. Speculative motive (uncertainties about money value of other assets)
The Demand for Money

Theories of Money Demand

—More generally, however, theories of money demand emphasise the role of money either as a store of value or as a medium of exchange.
The Demand for Money

Theories of Money Demand

—And as already noted, the theories are built around a trade-off between the benefits of holding more money versus the interest costs of doing so.
The Demand for Money

Portfolio Theories of Money Demand

• Portfolio theories emphasise the role of money as a store of value.

• Thus, people hold money as part of their portfolio of assets, because money offers a different kind of risk and return than other assets.
The Demand for Money

Portfolio Theories of Money Demand

• Compared to stocks and bonds, money offers a safe (nominal) return*.

• Given that the return on most assets is uncertain, it would be unwise to hold the entire portfolio in a single risk asset.
The Demand for Money

Portfolio Theories of Money Demand

• Portfolio theories therefore predict that the demand for money should depend on the risk and return offered by money, and by the various assets households can hold, as well as on total wealth.
The Demand for Money

Portfolio Theories of Money Demand

• The money demand function might therefore be written as:

\[ \left( \frac{M}{P} \right)^d = L(r_s, r_b, E \pi, W) \]
The Demand for Money

Portfolio Theories of Money Demand

• Where the variables are defined as follows:
  • $r_s$ is the expected return on stock
  • $r_b$ is the expected return on bonds
  • $E\pi$ is the expected inflation rate
  • $W$ is wealth
The Demand for Money

Portfolio Theories of Money Demand

• An increase in $r_s$ reduces money demand

• An increase in $r_b$ reduces money demand

The situation above arises because other assets become more attractive.
The Demand for Money

Portfolio Theories of Money Demand

• An increase in $E_\pi$ also reduces money demand because money becomes less attractive ($-E_\pi$ is the expected real return to holding money).

• An increase in $W$ raises money demand, because the greater wealth, the larger a portfolio.
The Demand for Money

Portfolio Theories of Money Demand

• Portfolio theories are applicable when we consider broad money. Hence, not in the case of \( M_1 = CC + DD \), which earn either zero or very low interest rates.

• Thus, from the view point of yield and risks of holding money, \( M_2 \) is more appropriate.
The Demand for Money

Portfolio Theories of Money Demand

• Economists refer to M1 as a dominated asset: as a store of value it exists alongside other assets that are always better.

• Thus, portfolio theories cannot explain the demand for these dominated forms of money.
The Demand for Money

Transactions Theories of Money Demand

• These emphasise the role of money as a medium of exchange.

• Transactions demand for money arises from the use of money in making regular payments for goods and services (money is held to finance purchases).
The Demand for Money

Transactions Theories of Money Demand

• These theories best explain why people hold narrow money, such as currency and demand deposits as opposed to savings accounts or treasury bills.

• There are several variants of transactions theories of money demand.
The Demand for Money

Transactions Theories of Money Demand

• The specific form they take depends on how one models the process of obtaining money and making transactions.

• But they all assume that money has the cost of earning a low rate of return and the benefit of making transactions more convenient.
The Demand for Money

Transactions Theories of Money Demand

• So the trade-off is between the amount of interest an individual forgoes by holding money and the costs and inconveniences of holding a small amount of money.

• To explain the demand for money, we rely on the Baumol-Tobin Model of Cash Management.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.

• This model analyses the costs and benefits of holding money.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.

• The benefit of holding money is convenience – avoiding the need to make several trips to the bank every time one needs to make a purchase - and interest earned on money held at the bank.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • The greater the number of trips to the bank, the larger the amount earning interest in the savings account.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.

• The cost of holding money is the interest forgone if the money was deposited in a savings account that paid interest, and the inconvenience of the trips to the bank to make daily withdrawals.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • We consider the case of an individual who is paid GHS 2,000 each month (GHS 24,000 over a year).
  • We assume the individual spends this amount evenly over the course of the month (and year) at a rate of about GHS 66/day.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • At one extreme, the person can take all the cash upfront and spend at a rate of GHS 66/day.
  • Or could leave the money in the bank (savings account), and travel to the bank each day to withdrawn GHS 66.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • In the second scenario, the individual earns interest on the money retained by the end of the month (consider the case of daily interest payments).
  • This interest earned will be a benefit to the individual.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • The cost of keeping money holdings down is simply the cost and inconvenience of daily trips to the bank to withdraw money.
  • Thus, the greater the number of trips to the bank, the larger the amount earning interest in the savings account.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • With one trip, no interest is earned. This possible pattern of spending is illustrated in the next slide.
  • The individual’s money holdings begin at $Y$ and end at zero, averaging $Y/2$ over the year.
  • Interest forgone is $i \times \text{GHS 12,000}$
The Demand for Money

(a) Money Holdings With One Trip to the Bank

Money holdings $Y$

Average $= \frac{Y}{2}$

Time
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • Suppose two trips are made, then on the first day, Y/2 (GHS 12,000) is withdrawn, and gradually spent to the middle of the year. And then the second trip is made to withdrawn Y/2 for the second half of the year.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • This pattern is depicted in the next slide, which shows that money holdings over the year vary between Y/2 and zero, averaging Y/4.
  • Because less money is held on average, the individual forgoes less interest, but has to make two trips to the bank.
The Demand for Money

(b) Money Holdings With Two Trips to the Bank

Money holdings

\[ Y/2 \]

Average = \( Y/4 \)

1/2

1

Time
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • More generally, if an individual makes N trips to the bank over the course of a year, then on each trip s/he withdraws Y/N amount of money, and then spends the money gradually over the following 1/Nth of the year.
  • This pattern is depicted in the next slide.
The Demand for Money

(c) Money Holdings With $N$ Trips to the Bank

Average = $\frac{Y}{2N}$
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • From the figure above, it is clear that money holdings will vary between \(Y/N\) and zero, thus averaging \(Y/(2N)\).
  • The fundamental question is in determining the optimal choice of \(N\).
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • Remember the greater N is, the less interest is forgone, but this has the inconvenience of making frequent trips to the bank.
  • Another way of looking at the problem is that the individual aims to minimize the cost of money management over the period.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • So, suppose $F$ is the cost of trips to the bank, which we assume fixed.
  • The interest rate, $i$, measures the opportunity cost of holding money.
  • Total cost is forgone interest plus cost of trips, which can be expressed as:
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.

\[ TC = \frac{iY}{(2N)} + FN \]

• The larger is N, the smaller the interest forgone, but the larger is the cost of going to the bank. This is depicted below:
The Demand for Money

![Graph showing the demand for money with cost, total cost, cost of trips to bank, and forgone interest equations. The graph illustrates number of trips that minimizes total cost at point N*.]
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  - This shows that there is one value of $N$ that minimizes total cost, which is the optimal value denoted by $N^*$.

$$N^* = \sqrt{\frac{iY}{2F}}$$
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.

• The average money holding is $Y/(2N^*)$ leads to the famous square-root Baumol-Tobin formula for the demand for money:

$$\frac{M}{P} = \sqrt{\frac{YF}{2i}}$$
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • The Baumol-Tobin demand for money shows that the demand for money decreases with the interest rate \(i\), and increases with the cost of transacting \(F\). 
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • Money demand increases with income ($Y$), but less than proportionately, and with the level of income ($Y$), but less than proportionately.
  • In other words there are *economies of scale* in cash management.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • The Baumol-Tobin demand for money also makes two very strong predictions:
    • (1): Income elasticity of money demand is $\frac{1}{2}$.
    • (2): Interest elasticity of money demand is $-\frac{1}{2}$.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • One implication from the Baumol-Tobin model is that any change in the cost of transacting, $F$, alters the money demand function.
  • That is, there is a change in the quantity of money demanded for any given $i$ and $Y$. 
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • Take for example the introduction of ATMs and Internet Banking, as well as Phone Banking services. These reduce $F$.
  • An increase in bank fees or charges increase $F$, whilst an increase in the real wage does the same.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • Nevertheless, though the Baumol-Tobin model gives us a specific money demand function, it does not give us reason to believe that this function will necessarily be stable over time.
Transactions Theories of Money Demand

- Baumol-Tobin Model of Cash Management.
  - By extending the analysis to include nonmonetary assets, such as bonds and stocks, the Baumol-Tobin model can be used to explain the case where individuals hold a portfolio of monetary and nonmonetary assets.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • We know that monetary assets are used for transactions but offer a low rate of return.
  • Suppose \( i \) is the difference in the return between monetary and nonmonetary assets.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • Suppose also that F is the cost of transforming nonmonetary assets into monetary assets, such as brokerage fees or charges paid to discount houses.
  • Then the fees/charges can be regarded in the same way as costs of trips to the bank.
The Demand for Money

Transactions Theories of Money Demand

• Baumol-Tobin Model of Cash Management.
  • The model therefore describes the demand for monetary assets.
  • And by showing that money demand depends positively on $Y$ and negatively on $i$, the model provides a microeconomic justification for the $(M/P)^d = L(i, Y)$ function.
The Demand for Money

Precautionary Motives of Money Demand

• The discussion on transactions motives focused on transactions costs arising from the need to make withdrawals or transform bonds into money, and vice versa.

• Transactions motives arise because of the need to smooth purchases over time given the irregular frequency of income.
Precautionary Motives of Money Demand

• But this ignores uncertainty: some purchases cannot be anticipated. Individuals are uncertain about the payments they might want, or have, to make, even in as short a time as a week or a few weeks ahead.

• With uncertainty, if an individual needs to make a purchase but has no money, they incur a loss.
The Demand for Money

Precautionary Motives of Money Demand

• However, the more money an individual, given the likelihood of uncertain purchases, the less likely s/he will incur the costs of illiquidity (that is, not having money immediately available).

• On the other hand, the more money an individual holds the more interest s/he has to forgo.
The Demand for Money

Precautionary Motives of Money Demand

• Hence, there is a trade-off that is similar to that identified in the transactions theory on money demand.

• This suggests that the greater the uncertainty about receipts (income) and expenditures, the greater is the demand for money.
The Demand for Money

Financial Innovation and Near Money

• Advances in technology have ensured that the financial sector has developed several new products, whilst traditional products have taken on new forms. Consequently the distinction between monetary and nonmonetary assets has become increasingly blurred.
The Demand for Money

Financial Innovation and Near Money

- **Near money** thus refers to nonmonetary assets, such as bonds and stocks and other such instruments that have acquired some of the liquidity of money.

- The consequence of this is that the demand for money is unstable, thus complicating monetary policy.